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The age-related patterns of preterm birth among urban African-American and non-Latina White mothers: The effect of paternal involvement

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ABSTRACT

Few studies have examined contributions of paternal factors to birth outcomes. Weathering is a pattern of increasing rates of adverse birth outcome with increasing maternal age. This study evaluates for an association between paternal involvement and weathering in the context of preterm birth (PTB, < 37 weeks) among non-Hispanic African-American and non-Hispanic White women with and without lifelong exposure to neighborhood poverty. Using the Illinois transgenerational dataset with appended US census income information of infants (1989–1991) and their mothers (1956–1976), we compared infants of women by degree of paternal involvement: married, unmarried with father named on birth certificate, and unnamed father. Data were stratified by maternal residence in higher or lower income neighborhoods at both the time of mothers' birth and infants' birth, estimating maternal lifelong economic context. We computed race-specific PTB rates according to maternal age, lifelong neighborhood income, and paternal involvement. We calculated Mantel-Haenszel chi-square tests of linear trend from contingency tables to evaluate weathering. Among African-Americans (n = 39,991) with unnamed fathers and lifelong residence in lower income neighborhoods, PTB rate was lowest among teens at 18.8%, compared to 21.5% for 30-35 year-old mothers (p for linear trend < 0.05). Among African-Americans with unnamed fathers and lifelong residence in higher income neighborhoods, PTB rate among teens was 16%, compared to 25% for 30-35 year-old mothers (p = 0.21). Among married African-Americans with lifelong residence in lower income neighborhoods, PTB rate among teens was 16.4%, compared to 12.5% for 30-35 year-old mothers (p = 0.79). Among married African-Americans with lifelong residence in higher income neighborhoods, PTB rate among teens was 20%, compared to 11.4% for 30-35 year-old mothers (p = 0.40). White mothers (n = 31,981) did not demonstrate weathering, regardless of paternal involvement and neighborhood poverty. We conclude that weathering was not seen among married African-Americans, independent of neighborhood income, suggesting a potentially protective mechanism associated with paternal involvement.

1. Background

The preterm birth (< 37 weeks, PTB) rate among African-American women is 1.6 times greater than that of non-Hispanic White women (Martin et al., 2015; Culhane and Goldenberg, 2011; Hamilton et al., 2013; Schaaf et al., 2013). A pattern of increasing rates of poor birth outcome with increasing maternal age among African-Americans has been described, with teenage mothers (compared to mothers in their 20s and early 30s) demonstrating the lowest risk of adverse pregnancy outcome. In contrast, White women in their 20s and 30s have lower rates of adverse reproductive outcomes compared to teenage White mothers. To offer a potential explanation for the racial differences in maternal age and birth outcome patterns, Geronimus first described a "weathering hypothesis," which is a deterioration in African-American women's health in early adulthood due to cumulative socioeconomic disadvantage (Geronimus, 1992). A health deterioration as early as age 15 among African-American mothers is described as contributing to the increasing disparity in birth outcomes between African-Americans and Whites with increasing maternal age (Geronimus, 1996). Supportive of this hypothesis, lower socioeconomic status seems to exacerbate these findings (Geronimus, 1996; Hibbs et al., 2016; Holzman et al., 2009). Specifically with regard to PTB, a variation on this pattern was demonstrated by Love et al., who described a PTB rate pattern among Whites that was highest among teens and lowest among women in their mid-twenties to mid-thirties (Love et al., 2010). In contrast, among African-American women, a higher PTB rate (compared to Whites) remained relatively stable among those aged 14–35 years (Love et al., 2010). The upstream factors responsible for this weathering

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phenomenon are incompletely understood, though maternal exposure to stress and cumulative social disadvantage have been implicated. (Geronimus, 1992), (Kramer et al., 2011), (Gavin et al., 2012)

A life-course perspective has been described, in which stressors throughout a woman's life accumulate and contribute to adverse birth outcomes (Lu and Halfon, 2003). The life-course model posits that exposures during sensitive developmental periods, an aggregate impact of risk factors, and a paucity of protective factors contribute to disparities in birth outcome between the races (Lu and Halfon, 2003). Exposure to poverty at multiple critical time points, or throughout the lifetime, is considered an important risk factor in the context of racial disparities in birth outcome.

Maternal and child health research has routinely investigated the relation of maternal characteristics to birth outcome, thereby overlooking the contribution of paternal factors. A handful of published studies show an association between lack of paternal involvement (as defined by absence of father's name on infant birth certificates) and adverse birth outcome, including PTB, low birth weight, and infant mortality (Gaudino et al., 1999; Ngui et al., 2009, 2015; Alio et al., 2010a; Salihu et al., 2014). Using Florida vital records, Alio et al. reported that African-American women who did not list the father's name on their infant's birth certificate (compared to those who named the father on the birth certificate) were at greatest risk of PTB (Alio et al., 2010a). A separate investigation found a stronger association between the absence of fathers' names on infant birth certificates and PTB rates among African-American compared to non-Hispanic White and Hispanic teens (Alio et al., 2011). While it is unclear whether the absence of a father's name on the birth certificate represents solely a lack of paternal involvement or is confounded by other factors in the parental relationship, it has been considered a proxy measure of lesser paternal involvement when compared to fathers who are named on their infants' birth certificates. It is unknown whether lack of paternal involvement is associated with a weathering pattern in PTB rates among non-Hispanic White and African-American women.

We, therefore, designed a population-based study to determine the extent to which paternal involvement is associated with the age-related patterns of PTB rates among urban African-American and non-Hispanic White mothers with lifelong residence in lower (versus higher) income urban neighborhoods. We hypothesized that a lack of paternal involvement is associated with a weathering pattern of rising PTB rates with advancing age among African-American women with lifelong residence in lower income neighborhoods.

2. Methods

The creation of an Illinois transgenerational dataset has previously been described in detail (David et al., 2010). It includes 267,303 infant birth certificates (born 1989–1991) linked to their mothers' (born 1956–1976) birth certificates. As such, the dataset was limited to 15–35 year old women. The study sample was restricted to singleton infants born to non-Hispanic African-American or non-Hispanic White women who resided in Cook County, Illinois (includes Chicago and its surrounding suburbs).

Based on census tract (or community area) listed on the vital records, median family income of place of residence was appended to each infant and maternal birth file (David et al., 2010). Neighborhoods with a median family income below the median (i.e. the lower two quartiles) were empirically classified as lower income, separately for early-life (birth of index infants' mother) and adulthood (birth of index infant) for both races. (Love et al., 2010)' (Collins et al., 2009) Neighborhoods with a median family income above the median (i.e. the upper two quartiles) were empirically classified as higher income, separately for early-life (birth of index infants' mother) and adulthood (birth of index infant) for both races. (Love et al., 2010)' (Collins et al., 2009) The neighborhood income cut-points for early-life and adulthood were $27,427 and $35,427, respectively. These two time points were used to estimate mothers' lifelong economic context. Only those with residence either in lower or higher income neighborhoods at both time points were included in the stratified analyses.

Gestational age was computed using last menstrual period, which was included on birth certificate data. A clinical assessment of gestational age was used in cases in which gestational age estimated by last menstrual period was unknown or questionable (outside of 20–44 week range or incongruous with birthweight). We calculated PTB rates among infants of < 20, 20–24, 25–29, and 30–35 year old African-American and White women (1989–1991 cohort) at birth according to paternal involvement (married, unmarried/named, unnamed) and maternal lifelong neighborhood economic context (lower, higher). The Mantel-Haenszel Chi-Square tests of linear trend were computed from contingency tables to evaluate for weathering. Analyses were performed using SAS Version 9.3.

Table 1
– Distribution of paternal involvement, maternal age, lifelong neighborhood income, and preterm birth (< 37 weeks) rates among African-Americans and non-Hispanic Whites.

	African-Americans (n = 39,991)	Non-Hispanic Whites (n = 31,981)
	n (%)	n (%)
Paternal involvement		
Married	8103 (20.3)	27,095 (84.7)
Unmarried, named	9242 (23.1)	2790 (8.7)
Unnamed	22,646 (56.6)	2096 (6.6)
Maternal age (years)		
< 20	10,202 (25.5)	1512 (4.7)
20–24	13,693 (34.2)	5631 (17.6)
25–29	10,584 (26.5)	13,031 (40.7)
30–35	5512 (13.8)	11,807 (36.9)
Lifelong neighborhood income		
Lower	20,097 (50.3)	1666 (5.2)
Higher	1338 (3.3)	18,705 (58.5)
Preterm birth		
Yes	6682 (16.7)	2207 (6.9)
No	33,309 (83.3)	29,774 (93.1)

3. Results

Table 1 compares the distribution of the main independent (paternal involvement, maternal age, lifelong neighborhood income) and dependent (PTB) variables among African-Americans (n = 39,991) and non-Hispanic Whites (n = 31,981). African-Americans had higher rates of unnamed fathers, with 56.6% of fathers not named on infant birth certificates, compared with 6.6% among non-Hispanic Whites. The vast majority (84.7%) of non-Hispanic White mothers were married, compared with only 20.3% of African-American mothers. African-Americans had a younger age distribution, with 25.5% of mothers delivering index infant in their teens, compared with 4.7% of teen mothers among non-Hispanic Whites. African-Americans were more likely than Whites to live in lower income neighborhoods: 50.3% compared to 5.2%, respectively. The PTB rate was higher among African-Americans compared to non-Hispanic Whites: 16.7% versus 6.9%, respectively.

There were 20,644 women excluded because they did not have lifelong residence in lower or higher income neighborhoods. Of those excluded, there were 10,995 African-Americans and 9649 White women. Table 2 demonstrates lifelong neighborhood income distribution of included and excluded African-American and White women.

Table 3 demonstrates the results of the stratified analysis, evaluating the association between maternal age and PTB rates by paternal involvement and race among mothers with lifelong residence in higher compared to lower income neighborhoods. A weathering pattern was demonstrated only among African-American mothers with unnamed fathers and lifelong residence in lower income neighborhoods.